Ergonomic Risk Assessment
Camp LeJeune
Navy Facilities (NAVFAC) East Division

An ergonomic risk assessment was conducted at Camp LeJeune on May 16, 2000. Three areas within medical records (inpatient, outpatient, and transcription) were observed in order to determine sources of ergonomic stress. This assessment is based upon interviews with employees, supervisors, and safety personnel as well as evaluation by the Hazard Abatement East Coast occupational ergonomist.

The Job Requirements and Physical Demands Survey (JRPD), an ergonomic survey, was also administered to the employees. The results of the JRPD indicate that the medical records area is an Ergonomic Problem Area with an overall priority value of 8, based on a scale of 1 to 9 where 9 is the greatest. All regions of the body were associated with significant priority ratings. Significant priority ratings indicate high levels of ergonomic risk combined with employee discomfort. The JRPD indicates the presence of pre-existing work-related musculoskeletal disorders and contributing factors among the employee population, which may have contributed to the overall priority score. A significant number of respondents replied that work-related pain or discomfort doesn't improve away from work and has interfered with carrying out normal activities. A number of employees have seen health care professionals within the past year regarding work-related pain and discomfort. Appendix I contains a summary of the JRPD results as well as a description of the methodology.

The Hazard Abatement Program traditionally does not fund the purchase of office equipment or furniture. For this evaluation, types of furniture and office products are recommended for purchase by the command. Catalogs from Alimed, Work-rite, BBT Group, Global Industrial, and the International Source for Ergonomics are attached to the report to provide specific product information. One of the recommended vendors, Work-rite, has a GSA schedule contract. Information on recommended features when purchasing chairs is provided in Appendix II. When making purchasing decisions, employee input is very valuable. It is often possible to obtain product samples on a trial basis to gather feedback.

For a guide on how to set up a computer workstation visit the web page for the Department of Defense Ergonomic Working Group
(http://chppm-www.apgea.army.mil/ergowg2/product.htm)
and download "Creating the Ideal Computer Workstation: A Step-by-Step Guide. A DoD Information Guide for Supervisors and Users June 2000"

I. Inpatient Services

There are currently 6 civilian employees working in inpatient services over two shifts. Employees in inpatient services are long-term employees with flexible schedules. Some employees work 9 hour days taking every other Friday off and some employees work 10-hour days taking every Friday off. Inpatient Services reviews medical records looking for deficiencies. Employees in this area also retire records for a few hours a day for just a few weeks during the year.

Employees in Inpatient Services review and file records, receive telephone calls, and enter information into the computer. About 75% of the day is spent typing with high mouse usage. Employees receive 10 to 15 short phone calls a day. There is one corner workstation in this area and four “L-shaped” workstations. The current desks are not deep enough to accommodate the computer equipment, records, and reference materials on the desk. In order to access all of the equipment, employees are working in awkward postures.

Recommendations:

Optimal Workstation

Desk Equipment and Layout
Observations:

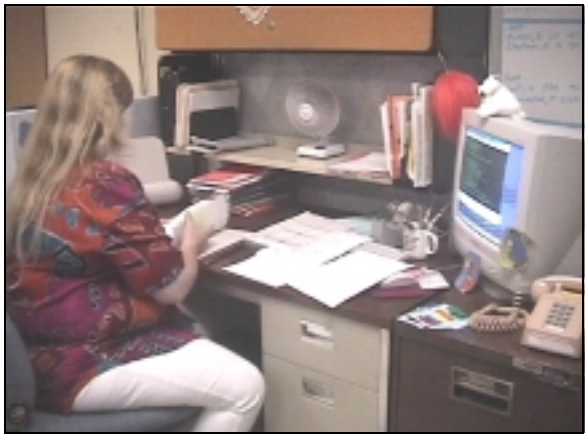

Figure 1: Computer Workstation

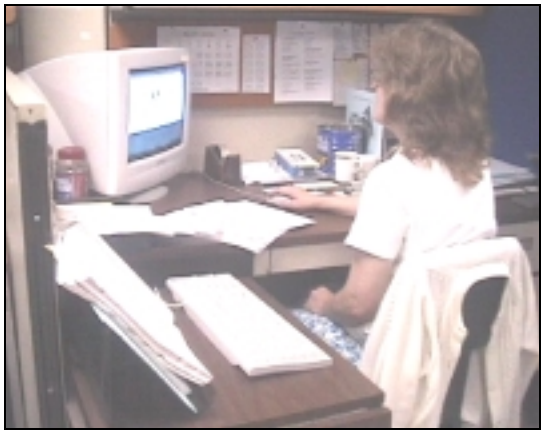

Figure 2: Alternate computer workstation layout

Figures 1 and 2, shown above, depict two different computer workstations in this area. The greatest ergonomic stressors in this area are reaching and awkward postures. Figure 1 shows a desk with a keyboard, partially covered by medical records, which requires the employee to type with her arms extended resting on the edge of the desk. Resting forearms on the edge of a desk causes contact stress. The employee has one knee outside the desk's leg area so she can angle her body towards the monitor and write at the same time. Manipulating the mouse requires a reach of 20". Accessing the telephone requires another extended reach. Awaiting medical records are stored on a shelf across from the user requiring a reach of 27". Reference materials are in a pull-out desk drawer to her left which causes additional twisting of the torso and neck. This employee has been in medical records for 6 years and has pain and discomfort in her hands.

The workstation, shown in Figure 2 has the keyboard located on the return and the mouse is in the corner with the monitor well above the user's seated elbow height. Mousing on a raised surface causes contact stress to the forearm. Reference materials are stored on a copy holder behind the keyboard. Keying on the keyboard or viewing reference materials requires twisting of the torso and neck. Medical records are placed in front of the monitor on the desk, encouraging repetitive non-neutral neck postures.

Recommendations:
The optimal workstation for this operation would be a height adjustable bi-level computer desk. The workstation should be adjusted such that the keyboard and mouse heights are equivalent to the user's seated elbow height. Seated elbow height is measured when the user is seated in a well-adjusted chair with their feet resting comfortably on the floor. The monitor should be equivalent to or 20° below the user's seated eye height. The monitor should be located directly behind the keyboard in perfect alignment with the operator. The work surface should be large enough to accommodate the employee's equipment (telephone, computer, etc.) and documents.

Chairs
Observations:
Many of the employees in this area have very old chairs in varying states of disrepair. A few of the employees provide their own cushions to compensate for a lack of lumbar support. Working in a chair that can not be adjusted to the proper height can place biomechanical and contact stress on the upper extremities. Insufficient back support can lead to fatigue and back pain. Sitting in a chair with a four star base can also be a safety hazard.

Recommendations:
Since these employees are seated at their desk for much of the day, they would benefit from ergonomic chairs. Guidelines for purchasing chairs are included in Appendix II. When buying chairs for a large area it is best obtain chair samples and gather employee feedback before making purchasing decisions.

Lighting
Observations:
The overhead lighting causes glare on the computer monitors, which can lead to eye strain and reduced productivity.

Recommendations:
Task lighting is preferable for computer use. Task lights can be purchased from your local office supply company or GSA vendor. Removing a portion of the bulbs in the overhead lights and/or using monitor filters can also reduce glare. Prior to adjusting the existing lighting, contact the cognizant Industrial Hygienist to request a lighting survey.

Input Devices
Observations:
Many of the employees currently have their mouse located at a distance from their keyboard, requiring an extended reach for mousing. Extended reaches place stress on the shoulders and often results in contact stress to the forearm. Some employees have placed their mouse in their lap to bring it closer. Mousing in one's lap would not be a problem, if the mouse were designed for it.

Recommendations:
There are many different input devices and accessories that can replace a traditional mouse. No one device is the best solution or can be learned by everyone; therefore employees should be allowed to try different devices. Some companies, like Alimed, have trial periods for products. Many local office supply stores have input devices on display that employees can be encouraged to visit. A mouse bridge can be placed over the numeric keypad to allow for mousing close to the user. A trackball is one option that uses less space than a conventional mouse. Thumb-operated trackballs are not recommended. A Glidepad uses less space and can also be used in the operator's lap. A foot operated mouse can eliminate the need for desk space all together. The mouse should be located at the same height as keyboard, at a height equivalent to the user's seated elbow height.

Additional Workstation Accessories
Observations:
Due to space constraints, reference materials are placed all over the workstation, requiring repetitive neck motions and awkward postures.

Recommendations:
Copy stands and read/write stands allow the employee to angle reference materials and medical records. These stands decrease the amount of repetitive neck motion associated with looking up and down from a document on a flat surface to a computer monitor. Stands should ideally be located as close to, and even just in front of, the monitor as possible to eliminate twisting of the neck. Copy stands are used when documents are solely being typed from. Read/write stands are for when documents are being typed from and written on. Heavy reference books require a heavy-duty document holder like the Atlas available from Atlas Ergonomic Book and Copy Holder (1-800-GET-ATLAS) for $99.

Certain ergonomic office products can improve productivity as well as employee comfort. Suggested products include automatic staplers and hole punches, ergonomic staple removers, and wide-body pens.

The Physical Therapy department at the hospital should be contacted to instruct employees on how to stretch during the day to relieve tension and promote blood flow and muscle activity.

Alternative Recommendations

Retrofit Workstation

The current workstations could be retrofitted with a variety of products for less cost than a new workstation. An adjustable height keyboard tray with room for the mouse could be attached to the desk. When properly adjusted, a keyboard/mouse tray promotes neutral typing postures. Monitor height can be temporarily adjusted using books to raise the viewing height. A monitor arm can also be used to adjust monitor height and maintain valuable desk space for records. The monitor arm should attach to the side of the table and have a swing mechanism for maximum maneuverability. A pull out work surface can be used in place of a drawer to give the employee space to write. A temporary solution is to continue to use drawers as writing surfaces. Placing a book or box in a drawer can create a solid writing surface. Most of the desks in inpatient services are too high for the users. Employees should raise their chairs so that their elbows are at their sides, forming a 90° angle without resting on the edge of the desk. Boxes or books can be used as temporary footrests if the chair is raised.

II. Transcription

There are currently 9 civilians working in transcription services. These workers are long term employees skilled in dictation. These employees spend about 8 hours each day using their dictation machine. Overtime is optional and can run up to 12 hours a day for 58 hours a week. The dictation machine is operated by foot pedal, which the employee holds down as the recording runs through headphones. The employee types out the recording on a personal computer workstation while listening through a headset.

Desk Equipment and Layout

Observations:

The employees in Transcription spend all day typing into dictation machines. There are many ergonomic stressors associated with typing, such as repetitive motions, awkward postures, mechanical stress, etc. Prolonged exposure to these stressors increases the risk of developing musculoskeletal disorders. The current workstations are not height adjustable and many of the keyboards are located above elbow height causing contact stress to the forearm and biomechanical stress to the wrists. Employees in this area expressed pain and discomfort in the shoulders, arms, and hands.

Recommendations:

The workstation recommendations are the same as for Inpatient Services: bi-level workstations, document holders, task lighting, and instruction on stretching exercises. For the current office layout, bi-level workstations are recommended, because the cubicle size won't accommodate retrofitting the desks with keyboard/mouse trays without forcing the employees out of their cubicles and into the aisles.

Headphones

Observations:

Transcription employees also noted that their headphones were quite painful.

Recommendations:

Since the operators wear these headphones all day, it is recommended that new headphones be purchased based on employee product reviews.

Footrests

Observations:

Employees performing dictation must repeatedly flex and extend their foot while operating the dictation machine, which can be stressful to the foot and ankle.

Recommendations:

A footrest with a built in dictation pedal would allow the operator to rest their feet while working to reduce some of the strain caused by holding the operating foot

in position. The “Wedo Relax” footrest has a special compartment to hold the dictation machine. This product is only available in Britain, but can be ordered over the web.

III. Outpatient Services

Outpatient services employs 4 active-duty personnel and 9 full-time civilians working 40 hours a week. One employee is currently on worker's compensation with a lifting injury and many others have suffered wrist and back injuries. Employees are currently experiencing fatigue in their knees, hands, and back.

Patient sheets (CHITS) arrive from doctor's office and are put in order by employees and hospital volunteers. Employees then take the CHITS for their respective filing area and pull the patient's file. Patients can also arrive in the area and request their file or to be entered into the computer system. Employees alternate sorting and filing either during the day or from day to day.

Recommendations

Automated Filing System
Observations:

Figure 3: Reading CHITS on the mobile table

Figure 4: Pulling a file

Figure 5: Pulling file from bottom shelf while reading CHIT

The employee takes the CHITS to their filing area and places them on a mobile height adjustable table. Reading CHITS on the table induces awkward neck postures, as shown in figure 3 above. Shelf heights range from 1" to 61". Accessing files on the top and bottom shelves is very stressful. A rolling stool is available to stand or sit on when pulling files from the top and bottom shelves. Figure 4 shows an employee reaching above shoulder height to pull a file. Figure 5 shows an employee with a bent back pulling a file off the bottom shelf while reading the CHIT placed on the table. The files are often packed tightly and require forceful pinch grips to retrieve. Computer and scanner use is less than an hour a day.

Recommendations:
The optimal solution for this area is an automated filing system. This system would provide all records at a constant neutral height. An automated filing system would eliminate bending to reach low shelves and straining to reach high shelves as well as increase productivity. The hospital obtained a quote for $217K for this system.

File Retirement
Observations:
For a few months employees go through all the files looking for inactive records. This process is called file retirement and is performed in each employee's free time. File retirement is the most repetitive and stressful task in outpatient services. In order to retire a record, it is pulled, opened, checked for activity, and either replaced or removed from the filing system. File retirement requires extended reaching to top and bottom shelves for files. Pulling files also places stress on the shoulder and wrists. File retirement is more stressful than regular file pulling due to the increased pace.

In addition, the current computer system is set up to indicate inactive files for retirement, but is not accurate.

Recommendations:
A temporary measure to reduce exposure frequency would be to spread retiring records through the entire year for shorter periods during the day, e.g. 15 minutes twice a day over the entire year.

Improving the quality of the computer program would increase productivity and reduce error rate. The files would not have to be manually reviewed one at a time if the computer was able to produce a complete list of all inactive files.

Micro-breaks
Employees should also be encouraged to take micro-breaks throughout the day and rotate tasks so they are not filing for extended periods of time.

Alternative Recommendations

If the current filing shelves are not replaced, a number of recommendations could aid the current system. More filing units should be obtained so that the files are not packed as tightly; thereby, reducing the force of the pinch grip required to remove each file. Employees should also have a stool with a backrest for reaching bottom shelves to relieve back strain. A locking step stool is recommended for reaching the top shelves safely. The height adjustable tables should have copy holders to reduce neck flexion while reading off the CHITS. The mobile tables should have a pneumatic or hydraulic height adjustment instead of a hand crank to aid in operation. An easily adjustable table is more likely to be adjusted than a hand crank operation table. A pneumatic or hydraulic handle also requires less force and repetitive motions to operate.

Lift Tables		
Vendor	Product	Price
Global Industrial 1-800-645-1232	Hydraulic Lift Table 16”x16” XF501098 Style A Also available 18”x18”	$263
Lab Safety 1-800-356-0783	Mobile Scissor Lift Table OM-18771 27.5”x17.75	$560
C&H 1-800-558-9966	Hydraulic Lift Table 16”x1671-514A Also available 18”x18”	$227
C&H 1-800-558-9966	Mobile Scissor Lift Table 71-752A 27.5”x17.75	$569

Appendix I- Medical Records
Job Requirements and Physical Demands Survey

Summary

The Job Requirements and Physical Demands Survey (JRPD) was administered to employees in the Medical Records Area. The results of the JRPD indicate that this is an Ergonomic Problem Area (EPRA) with an overall priority score of 8 (on a scale of 1-9, where 9 has the greatest priority). The JRPD looks at five distinct body areas: shoulder/neck, hand/wrist/arm, back/torso, legs/feet, and head/eyes. All five body regions were associated with significant risk. The overall priority value is based upon the highest priority ranking for a single body area. Priority scores are based upon assessed ergonomic risk and employee discomfort. The inpatient and transcription areas can be addressed with ergonomic office equipment. The hazards associated with the outpatient area would best be reduced with an automated record retrieval system. Until a retrieval unit can be obtained, job rotation and micro-breaks can be used to alleviate stress associated with repetitive filing. The JRPD indicates the presence of pre-existing work-related musculoskeletal disorders and contributing factors among the employee population, which may have contributed to the overall priority score. A significant number of respondents replied that work-related pain or discomfort doesn't improve away from work and has interfered with carrying out normal activities. A number of employees have seen health care professionals within the past year regarding work-related pain and discomfort. The specific results of the JRPD as well as a brief discussion of methodology are as follows:

Population Data

Surveys were completed and returned by 18 employees in the medical records area, resulting in a **response rate of 64%.** An 80% response rate is desired for statistical significance. The population surveyed was **72% female** and **28% male** and **94% civilian** and **6% military. 6%** of the respondents were between the ages of **21 and 30, 17%** were between **31 and 40**, and **78%** were **over 41** years old. **94%** of the employees have been in their current position at the same base over **1 year.** Age can be a contributing factor for musculoskeletal disorders.

Body Regions

The JRPD prioritizes five distinct body regions based upon a combination of ergonomic risk factors and discomfort. Employees are asked to indicate the duration for which they are exposed to different ergonomic risk factors. Ergonomic risk factors include posture, force, frequency, repetition, vibration, contact stress, and restrictive personal protective equipment. Discomfort is assessed through frequency and severity for each of the five body regions. Table 1 demonstrates the relationship between body region and discomfort and risk.

The priority score, from 1 to 9, is also shown for each body region. The shoulder/neck and back/torso regions have maximum priority scores.

Table 1: Results by Body Part						
		Shoulder/ Neck	Hand/ Wrist/ Arm	Back/ Torso	Leg/ Torso	Head/ Eye
Risk	Prevalence	33%	39%	22%	61%	72%
	Rating	Medium	Medium	Low	High	High
Discomfort	Prevalence	61%	78%	67%	56%	50%
	Rating	High	High	High	Medium	Medium
Priority Score		8	8	6	7	7

Risk prevalence is determined by the percentage of respondents indicating a specific number of ergonomic risk factors for a duration greater than 2 hours a day. Ratings are determined by prevalence. Low ratings represent less than 30% prevalence, medium is 31% to 60% and high is greater than 61%.

Discomfort is categorized by the terms discomfort, fatigue, numbness, and pain. The following combinations of frequency and severity indicate discomfort prevalence. Discomfort rankings are determined by the percentage of respondents with prevalent discomfort. Table 2 contains the discomfort criteria based upon frequency and severity.

Table 2: Discomfort Criteria			
	Mild	Moderate	Severe
Daily	*	*	*
Weekly		*	*
Monthly			*

The body regions are prioritized based on the following ranking matrix. Table 3 demonstrates the relationship between discomfort and risk, which determines priority.

Table 3: Ranking Matrix	**Discomfort**			
Risk Factor		High	Medium	Low
	High	9*	7*	4
	Medium	8*	5*	2
	Low	6*	3	1

The ranking of a body part determines its priority. A ranking greater than 4, indicated by an *, is significant. The overall priority ranking is equal to the highest value, in this case 8. All body regions have significant risk.

Organizational Information- Low

Organizational factors can also be ergonomic stressors. The organizational score for this area was low, which indicates that job stress factors are of minimal concern. Survey respondents were asked if they understood their job responsibilities, if their workload was too heavy, if they are able to get pertinent information, etc. This score can be improved by providing workers with more autonomy and improving discussion and feedback between employees and supervisors.

Physical Effort- 5.17

Survey results indicate an average physical effort score of 5.17. Respondents were asked to describe the physical effort required of their job on a scale of 1 to 15 where 1 is no exertion at all and 15 is maximal exertion. A value of 6 is light, indicating a non-strenuous operation.

Health Care Provider Score- 8

According to the health care provider score, 8 employee reported having been to a health care provider in the last 12 months for pain or discomfort that he or she thinks relates to her job. This is a significant value considering there were 18 respondents.

Recovery Time Score- 38.89

38.89% of the survey respondents reported having experienced work-related pain or discomfort that does not improve when he or she is away from work overnight or over the weekend. This value indicates a likely ergonomic problem area.

Activity Interruption Score- 55.56

55.56% of the respondents indicated that in the past 12 months, work-related pain or discomfort has caused his or her difficulty in carrying out normal activities (e.g. job, hobby, leisure, etc.). This value indicates a likely ergonomic problem area.

Previous Diagnosis Score- 44.44

The survey asks if “a health care provider ever told you that you have any of the following conditions which you think might be related to your work?

Tendonitis/Tenosynovitis	Ganglion Cyst	Trigger Finger
Epicondylitis (Tennis Elbow)	Bursitis	Carpal Tunnel Syndrome
Thoracic Outlet Syndrome	Back Strain	Knee or Ankle Strain

Overuse Syndrome”

44.44% of respondents indicated affirmatively. Pre-existing work-related musculoskeletal disorders can contribute to an employee’s pain and discomfort levels; thereby affecting the overall priority score. Working conditions may exacerbate a pre-existing disorder.

Contributing Factors- 44.44

Respondents were asked if they had ever had one or more of the following conditions:

Wrist Fracture	Hypertension	Kidney Disorders
Thyroid Disorders	Diabetes	Gout
Rheumatoid Arthritis		

44.44% of the respondents indicated affirmatively. These health conditions are contributing factors and may increase one’s risk of developing a musculoskeletal disorder; thereby affecting overall priority.

Routine Task Distribution

The following tasks were noted by the more than 50% of the employees as being routine (performed on three or more days per week):

Calling (telephone use)
Filing (general administrative)
Monitoring (visual displays)
Mousing
Stapling
Typing/Keying

Process Improvement Opportunities

This section allows employees to write in responses to questions. All statements are included exactly as written by the employee.

1. Which tasks are the most awkward or require you to work in the most uncomfortable position?

    - Sitting 8 hours a day, typing + using headphones that hurt your ears- basically the job!
    - Sitting all day typing and pushing pedal and wearing headsets they kill your ears
    - Filing records and chits in top + bottom rows (three responses)
    - Retrieving of medical records (annual)
    - Typing- desks not at proper height causing wrist pain and neck strain

- Uncomfortable chairs
- Tables are awkward (inappropriate height)
- Having to log work done and twisting with foot on foot pedal, unable to read papers type from, no footrests, bad chair, inappropriate table heights
- Pulling charts (outpt. Records) that are in too tight a space
- Typing using computer with improper workspace!

2. Which tasks take the most effort?

    - Sitting all day typing and pushing pedal wearing headsets all day
    - Stapling hurts hands
    - Pulling records from tight areas
    - Pulling records + filing chits on bottom rows
    - Retrieving of medical records (annual)
    - Trying to hear with all the noise
    - Listening to dictation (two responses)
    - Pulling records from tight area * walk around cause feel *hot* too much on stress pressure
    - Avoiding out guides that are worn, broke edges, and pointed edges

3. Are there any tools or pieces of equipment that are notoriously hard to work with?

    - Table with CHCS terminals on it needs to be 18” wider + 3” longer to accomidate 3 CHCS terminals
    - Headsets for transcription, foot pedals (three responses)

4. If you could make any suggestions that would help you do your job more easily or faster or better, what would you suggest.

    - Furnishings, cubicles, equipment designed for trasncriptionists-ergonomically correct for various sizes, shapes, medical conditions.
    - Get stools for the pedal so it is higher and doesn’t slip around
    - New chairs footrests computer screen shield for glare printer/copier closer to work station
    - Using large, color-coated numbers on side of records to prevent time loss due to misfiled or lost medical records
    - Teach supervisor how to use the supply system. Teach supervisor how to listen to workers suggestions and concerns
    - Computer desks, better lighting
    - Soundproof cubicles

- Enclosed cubicles for privacy to cut down on noise, up to date reference books, footrests, better chairs, better climate control (too cold)
- Enclosed cubicles, better climate control, footrests, better chairs, better tables, better reference materials, better lighting
- Use large “color” numbers on side of file row- also hire more people help make new jackets to catch up everyday than keep unload-
- Space, we can use filing space, we can also use an extra terminal (two terminals for use by six or more personnel)
- Give total new workspace with clear new work supplies- needed desparately

Appendix II
Purchasing Chairs

Recommendations for Purchasing Chairs*

These recommendations ensure that the chair can be fitted to each individual user and that the user can easily adjust the chair to vary his or her posture throughout the day.

1. Adjustable seat pan height (pneumatic)

2. Independent, height-adjustable backrest

3. Adjustable seat pan depth

4. High density foam used in seat pan, with cloth fabric (except in clean room settings)

5. Armrests not required, if present they should adjust in both height and width

6. Minimum contouring of seat pan

7. Backrests at least 12x12 inches, with pronounced lumbar support

8. Angle between backrest and seat pan should have a range of 90-110 degrees

9. Seat pan 18-20 inches wide

10. Seat pan rocking mechanism and/or forward/backward tilt. Seat pan angle should have a range of 0-10 degrees

11. Swivel capability

12. Changes should be possible while user is seated

13. 5-star base with appropriate casters – carpet or linoleum

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